PEACE/WILLISTON
FISH & WILDLIFE
COMPENSATION
PROGRAM

BC hydro

BRITISH
COLUMBIA

Water Temperatures of the Nation and Mesilinka River Systems 1995

A. R. Langston
November 1995

PWFWCP Report No. 83

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The Peace/Williston Fish & Wildlife Compensation Program is a cooperative venture of BC Hydro and the provincial fish and wildlife management agencies, supported by funding from BC Hydro. The Program was established to enhance and protect fish and wildlife resources affected by the construction of the W.A.C. Bennett and Peace Canyon dams on the Peace River, and the subsequent creation of the Williston and Dinosaur Reservoirs.

Peace/Williston Fish and Wildlife Compensation Program, 1011 Fourth Ave. 3rd Floor, Prince George B.C. V2L 3H9

Website: *www.bchydro.bc.ca/environment/initiatives/pwcp/*

This report has been approved by the Peace/Williston Fish and Wildlife Compensation Program Fish Technical Committee.

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INTRODUCTION

During the 1991 summer field season (June - October) rivers within the Williston Reservoir Watershed were investigated to identify a suitable system for a pilot stream fertilization project. Studies of chemical, physical, and biological characteristics of Williston Watershed rivers (Barrett and Halsey 1985, Bruce and Starr 1985, Langston and Blackman 1993) were reviewed and suitable systems selected for preliminary analysis.

The Mesilinka River was selected as the most suitable system for the pilot project of nutrient enrichment. The Nation River was identified as a system which would also benefit greatly from a fertilization program, but would not meet as many of the pilot project objectives as the Mesilinka River (ie. The Mesilinka River is considered to be more representative of the rivers found in the Williston Watershed). Results and methodologies of the 1991 preliminary studies are reported in "Stream fertilization feasibility study 1991 data report" (Langston, 1992).

In 1992 a five year pilot project was initiated on the Mesilinka River to assess the success of a fertilization program on a Northern B.C. interior river system. The project is funded by the Peace/Williston Fish & Wildlife Compensation Program. Program design/implementation and the majority of data collection/analysis is performed by the Ministry of Environment, Lands and Parks Fisheries Research Branch.

This data report summarizes the water temperature data collected from the Mesilinka and Nation Rivers during the summer of 1995. This data is one component of the essential information required to facilitate the proper experimental design of the nutrient enrichment program.

Water temperature data reports (Langston 1992, 1993, 1994) have been produced for these river systems as part of the Fertilization project initiated in 1991.

STUDY AREA

The Williston watershed is located in north central British Columbia with its southern boundary 40 km. north of Prince George. The watershed area is 70,860 km^2. The study area and rivers examined are depicted in figures 1,2, and 3. A more detailed description of the study area is available in the "Williston Lake Fisheries Compensation Program management plan" (Blackman et al 1990).

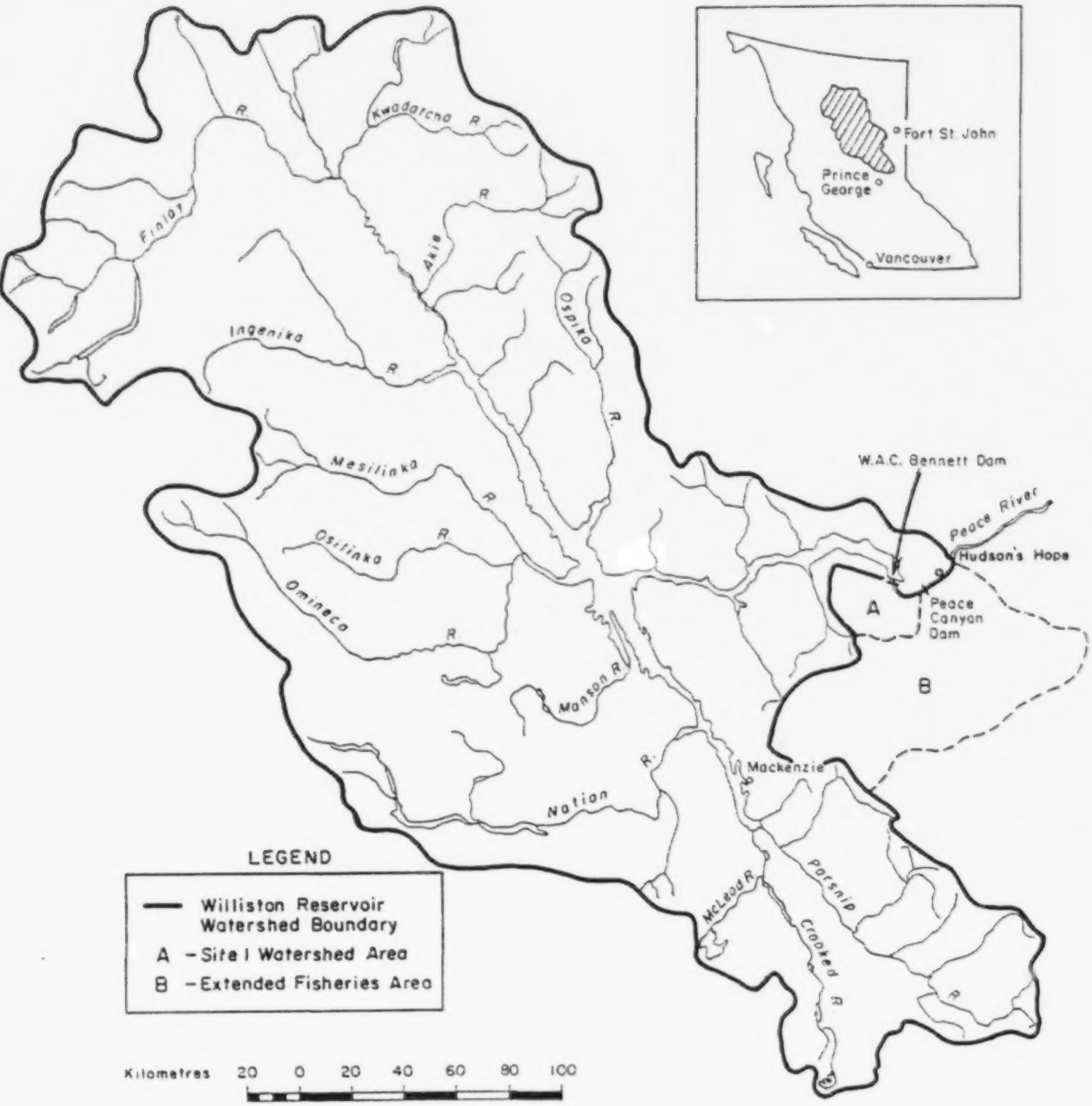

Fort St. John
Prince George
Vancouver
Finlay R.
Kwadacha R.
Akie R.
Ingenika R.
Ospika R.
Mesilinka R.
Osilinka R.
Omineca R.
Manson R.
Nation R.
Mackenzie
McLeod R.
Parsnip R.
Crooked R.
W.A.C. Bennett Dam
Peace River
Hudson's Hope
Peace Canyon Dam
A
B
LEGEND
Williston Reservoir Watershed Boundary
A - Site I Watershed Area
B - Extended Fisheries Area
Kilometres 20 0 20 40 60 80 100

figure 1

MESILINKA RIVER

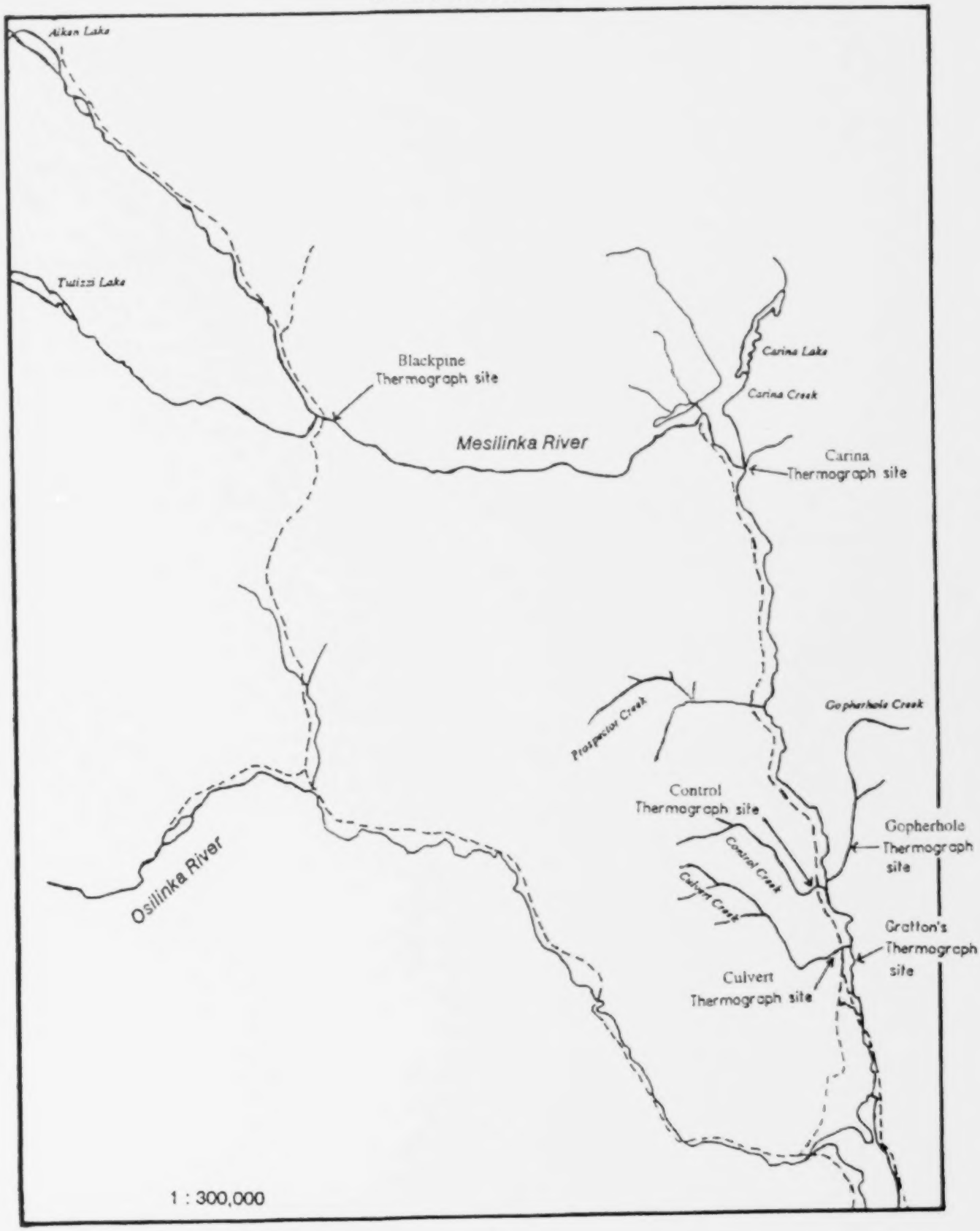
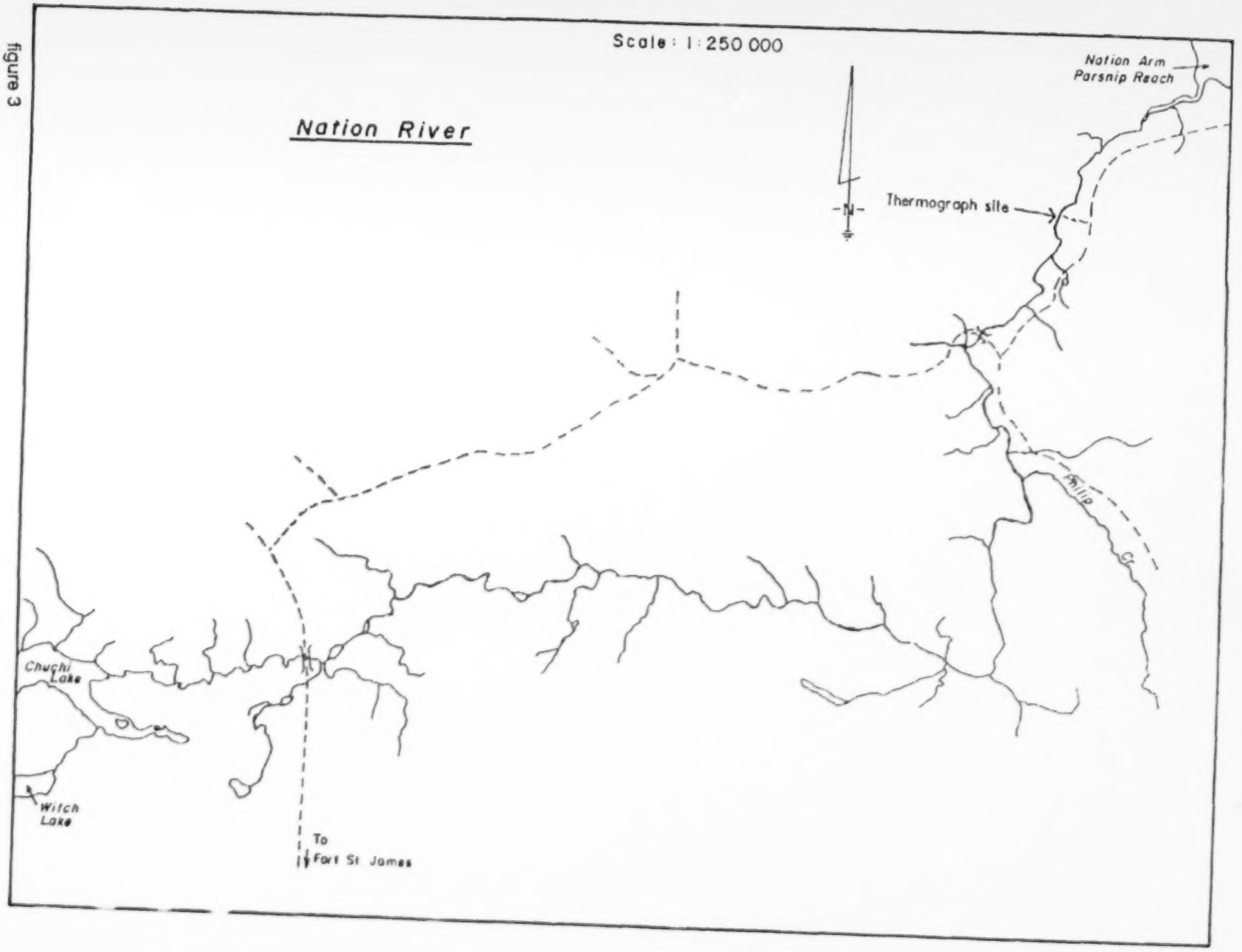


figure 2

figure 3


Scale : 1:250 000
Nation River
Nation Arm
Parsnip Reach
Thermograph site
N
Phillip Cr.
Chuchi Lake
Witch Lake
To
Fort St James

METHODS AND MATERIALS

Water temperatures were monitored at preselected locations (see figure 2 for Mesilinka River system sites) with temperature recording data loggers (Onset Instruments Stowaway miniature data loggers). These units are certified to be accurate to ± 0.2° C. Nation River water temperatures were monitored at the Water Survey of Canada study site (figure 3). The Temperature Dataloggers were programmed to record water temperatures at two hour sampling intervals. The sites were checked occasionally to ensure the units were completely submerged.

RESULTS

No formal discussion of the results is presented as this data report is intended primarily as an information source only. Water temperature data results are presented in table and graph format. Mean temperatures by; month, and sampling period duration, are summarized and presented in table 1.

Table 1. Mean water temperatures by; month, and sampling period duration.

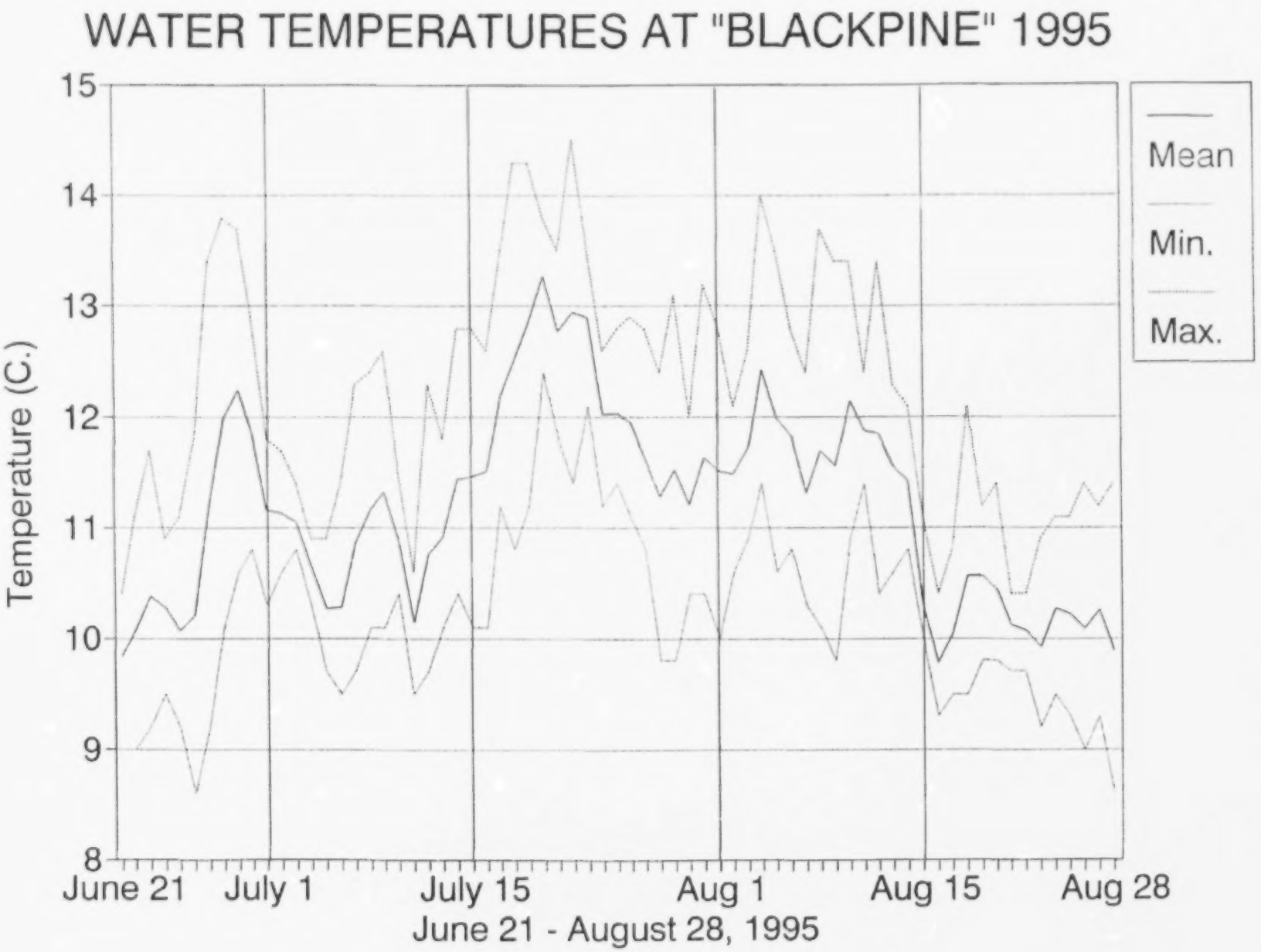
LOCATION	RECORDING PERIOD	JUNE	JULY	AUG.	DURATION
Blackpine	June 21 - August 28	10.8	11.5	11.0	11.2
Carina	June 21 - August 28	15.1	14.4	12.6	13.8
Control	June 18 - August 28	7.4	7.8	7.1	7.4
Culvert	June 18 - August 28	8.1	8.6	7.9	8.2
Fatfish	June 21 - August 28	8.6	10.8	7.0	9.0
Gopherhole	June 18 - August 28	8.0	8.5	7.9	8.2
"Gratton's"	June 18 - August 28	11.5	11.6	10.9	11.3
Natron R	June 22 - August 29	15.9	16.1	13.1	15.1

The Natron River Temperature Datalogger was exposed to air temperatures from August 7 - 15 due to receding water levels. The mean water temperatures for the Nation River were calculated excluding the data obtained from the August 7 - 15 period.

The Culvert Creek Temperature Datalogger was exposed to air temperatures on August 9 and 10. The mean water temperatures for Culvert Creek were calculated excluding the data obtained on August 9 and 10.

WATER TEMPERATURES OF MESILINKA RIVER AT "BLACKPINE" LOCATION

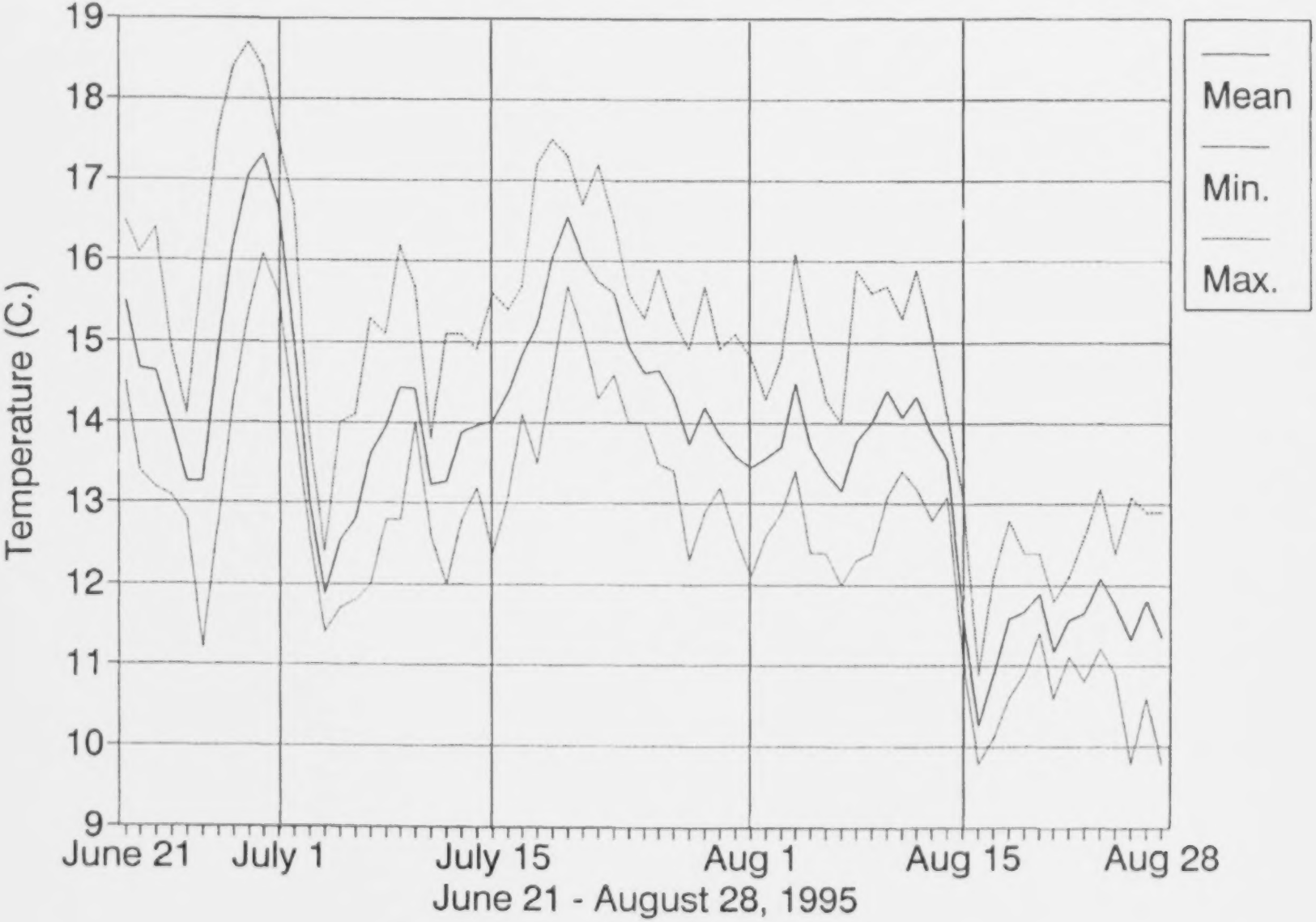
DATE	MEAN	MIN.	MAX.	DATE	MEAN	MIN.	MAX.	DATE	MEAN	MIN.	MAX.
June 1				July 1	11.2	10.3	11.8	Aug. 1	11.5	10	12.8
June 2				July 2	11.1	10.6	11.7	Aug. 2	11.5	10.6	12.1
June 3				July 3	11.1	10.8	11.4	Aug. 3	11.7	10.9	12.6
June 4				July 4	10.6	10.3	10.9	Aug. 4	12.4	11.4	14
June 5				July 5	10.3	9.7	10.9	Aug. 5	12.0	10.6	13.5
June 6				July 6	10.3	9.5	11.4	Aug. 6	11.8	10.8	12.8
June 7				July 7	10.9	9.7	12.3	Aug. 7	11.3	10.3	12.4
June 8				July 8	11.2	10.1	12.4	Aug. 8	11.7	10.1	13.7
June 9				July 9	11.3	10.1	12.6	Aug. 9	11.6	9.8	13.4
June 10				July 10	10.9	10.4	11.5	Aug. 10	12.1	10.9	13.4
June 11				July 11	10.2	9.5	10.6	Aug. 11	11.9	11.4	12.4
June 12				July 12	10.8	9.7	12.3	Aug. 12	11.9	10.4	13.4
June 13				July 13	10.9	10.1	11.8	Aug. 13	11.6	10.6	12.3
June 14				July 14	11.4	10.4	12.8	Aug. 14	11.4	10.8	12.1
June 15				July 15	11.5	10.1	12.8	Aug. 15	10.3	10	11.1
June 16				July 16	11.5	10.1	12.6	Aug. 16	9.8	9.3	10.4
June 17				July 17	12.2	11.2	13.4	Aug. 17	10.0	9.5	10.8
June 18				July 18	12.5	10.8	14.3	Aug. 18	10.6	9.5	12.1
June 19				July 19	12.9	11.2	14.3	Aug. 19	10.6	9.8	11.2
June 20				July 20	13.3	12.4	13.8	Aug. 20	10.4	9.8	11.4
June 21	9.8	9	10.4	July 21	12.8	11.8	13.5	Aug. 21	10.1	9.7	10.4
June 22	10.1	9	11.1	July 22	12.9	11.4	14.5	Aug. 22	10.1	9.7	10.4
June 23	10.4	9.2	11.7	July 23	12.9	12.1	13.5	Aug. 23	9.9	9.2	10.9
June 24	10.3	9.5	10.9	July 24	12.0	11.2	12.6	Aug. 24	10.3	9.5	11.1
June 25	10.1	9.2	11.1	July 25	12.0	11.4	12.8	Aug. 25	10.2	9.3	11.1
June 26	10.2	8.6	11.8	July 26	12.0	11.1	12.9	Aug. 26	10.1	9	11.4
June 27	11.2	9.2	13.4	July 27	11.6	10.8	12.8	Aug. 27	10.3	9.3	11.2
June 28	12.0	10.1	13.8	July 28	11.3	9.8	12.4	Aug. 28	9.9	8.6	11.4
June 29	12.2	10.6	13.7	July 29	11.5	9.8	13.1	Aug. 29			
June 30	11.9	10.8	12.9	July 30	11.2	10.4	12	Aug. 30			
				July 31	11.6	10.4	13.2	Aug. 31			


WATER TEMPERATURES AT "BLACKPINE" 1995
Temperature (C.)
15
14
13
12
11
10
9
8
June 21
July 1
July 15
Aug 1
Aug 15
Aug 28
June 21 - August 28, 1995
Mean
Min.
Max.

WATER TEMPERATURES AT CARINA CREEK 1995

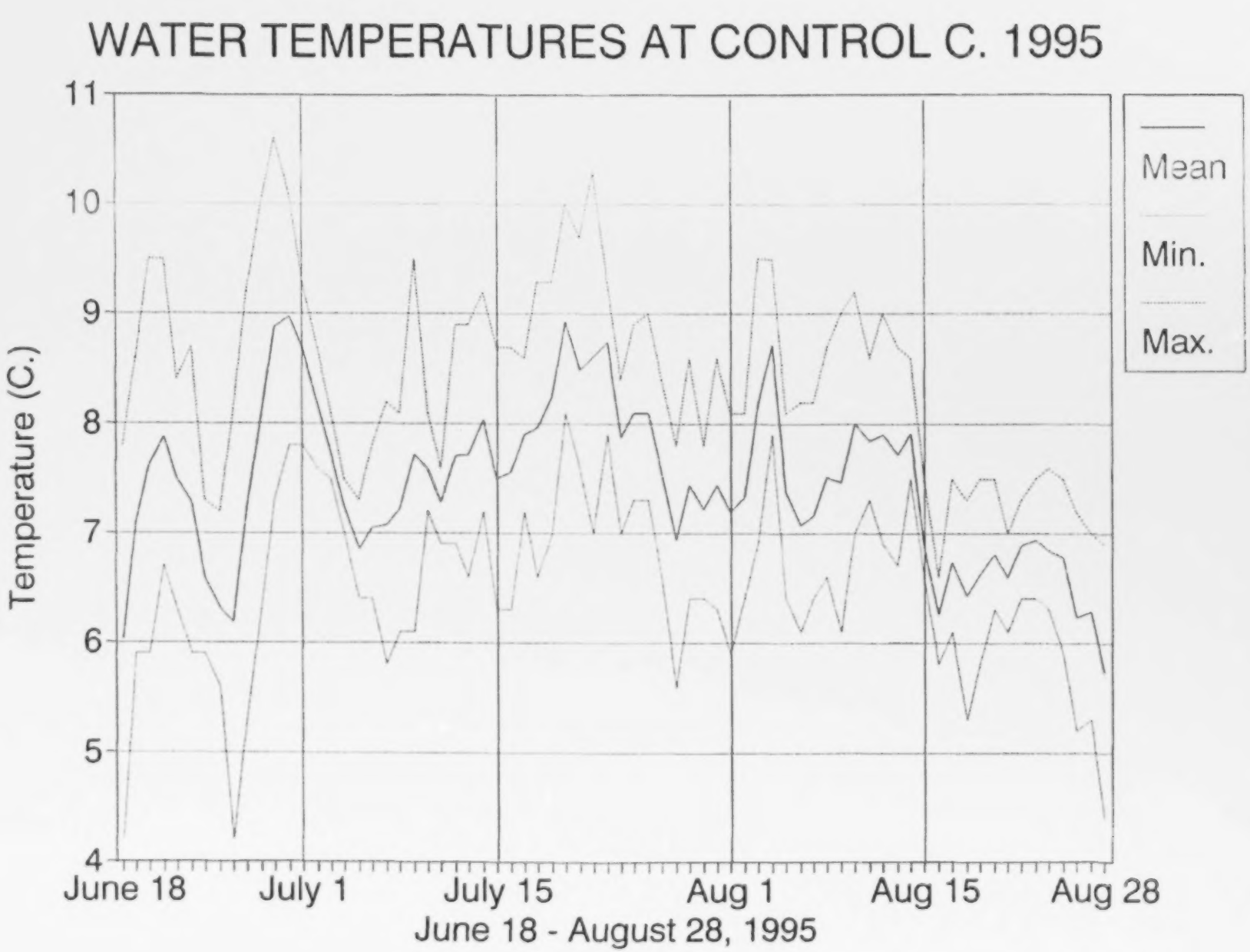
DATE	MEAN	MIN.	MAX.	DATE	MEAN	MIN.	MAX.	DATE	MEAN	MIN.	MAX.
June 1				July 1	16.7	15.6	17.5	Aug. 1	13.4	12.1	14.8
June 2				July 2	15.0	14.1	16.7	Aug. 2	13.6	12.6	14.3
June 3				July 3	13.0	12.6	13.8	Aug. 3	13.7	12.9	14.8
June 4				July 4	11.9	11.4	12.4	Aug. 4	14.5	13.4	16.1
June 5				July 5	12.5	11.7	14.0	Aug. 5	13.7	12.4	15.1
June 6				July 6	12.8	11.8	14.1	Aug. 6	13.4	12.4	14.3
June 7				July 7	13.6	12.0	15.3	Aug. 7	13.2	12.0	14.0
June 8				July 8	13.9	12.8	15.1	Aug. 8	13.8	12.3	15.9
June 9				July 9	14.4	12.8	16.2	Aug. 9	14.0	12.4	15.6
June 10				July 10	14.4	14.0	15.7	Aug. 10	14.4	13.1	15.7
June 11				July 11	13.2	12.6	13.8	Aug. 11	14.1	13.4	15.3
June 12				July 12	13.3	12.0	15.1	Aug. 12	14.3	13.2	15.9
June 13				July 13	13.9	12.8	15.1	Aug. 13	13.9	12.8	15.1
June 14				July 14	14.0	13.2	14.9	Aug. 14	13.6	13.1	14.1
June 15				July 15	14.0	12.4	15.6	Aug. 15	11.6	11.1	13.1
June 16				July 16	14.4	13.1	15.4	Aug. 16	10.3	9.8	10.9
June 17				July 17	14.8	14.1	15.7	Aug. 17	10.9	10.1	12.1
June 18				July 18	15.2	13.5	17.2	Aug. 18	11.6	10.6	12.8
June 19				July 19	16.0	14.6	17.5	Aug. 19	11.7	10.9	12.4
June 20				July 20	16.6	15.7	17.3	Aug. 20	11.9	11.4	12.4
June 21	15.5	14.5	16.5	July 21	16.0	15.1	16.7	Aug. 21	11.2	10.6	11.8
June 22	14.7	13.4	16.1	July 22	15.7	14.3	17.2	Aug. 22	11.6	11.1	12.1
June 23	14.6	13.2	16.4	July 23	15.6	14.6	16.5	Aug. 23	11.6	10.8	12.6
June 24	14.0	13.1	14.9	July 24	14.9	14.0	15.6	Aug. 24	12.1	11.2	13.2
June 25	13.3	12.8	14.1	July 25	14.6	14.0	15.3	Aug. 25	11.8	10.9	12.4
June 26	13.3	11.2	15.9	July 26	14.6	13.5	15.9	Aug. 26	11.3	9.8	13.1
June 27	14.9	12.8	17.6	July 27	14.3	13.4	15.3	Aug. 27	11.8	10.6	12.9
June 28	16.2	14.3	18.4	July 28	13.7	12.3	14.9	Aug. 28	11.3	9.8	12.9
June 29	17.1	15.4	18.7	July 29	14.2	12.9	15.7	Aug. 29			
June 30	17.3	16.1	18.4	July 30	13.9	13.2	14.9	Aug. 30			
				July 31	13.6	12.6	15.1	Aug. 31			

WATER TEMPERATURES AT CARINA CREEK 1995



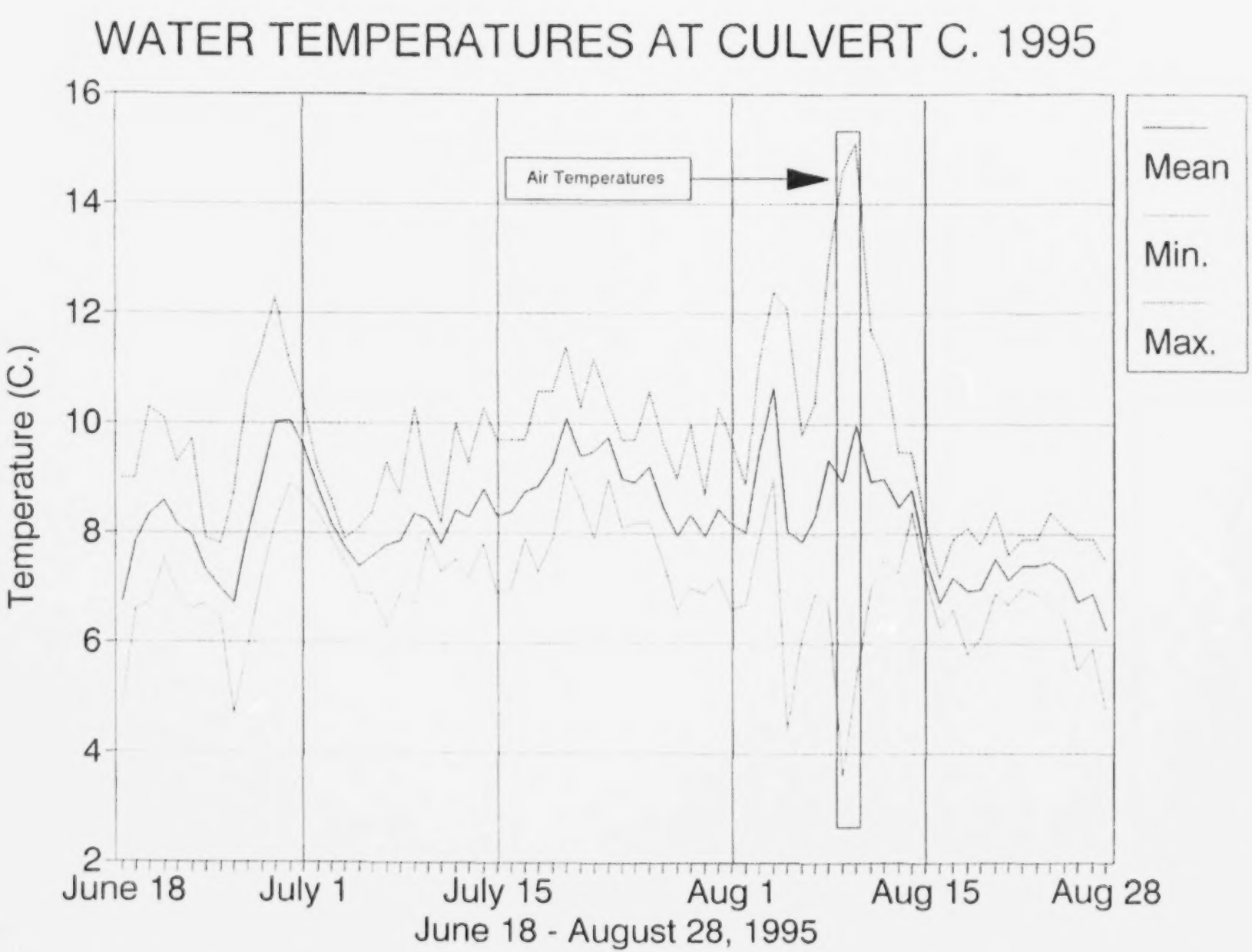
WATER TEMPERATURES AT CONTROL CREEK 1995

DATE	MEAN	MIN.	MAX.	DATE	MEAN	MIN.	MAX.	DATE	MEAN	MIN.	MAX.
June 1				Julyl	8.7	7.8	9.3	Aug. 1	7.2	5.9	8.1
June 2				July 2	8.2	7.6	8.7	Aug. 2	7.3	6.4	8.1
June 3				July 3	7.7	7.5	8.1	Aug. 3	8.2	6.9	9.5
June 4				July 4	7.2	7	7.5	Aug. 4	8.7	7.9	9.5
June 5				July 5	6.9	6.4	7.3	Aug. 5	7.4	6.4	8.1
June 6				July 6	7.1	6.4	7.8	Aug. 6	7.1	6.1	8.2
June 7				July 7	7.1	5.8	8.2	Aug. 7	7.2	6.4	8.2
June 8				July 8	7.2	6.1	8.1	Aug. 8	7.5	6.6	8.7
June 9				July 9	7.7	6.1	9.5	Aug. 9	7.5	6.1	9
June 10				July 10	7.6	7.2	8.1	Aug. 10	8.0	7	9.2
June 11				July 11	7.3	6.9	7.6	Aug. 11	7.8	7.3	8.6
June 12				July 12	7.7	6.9	8.9	Aug. 12	7.9	6.9	9
June 13				July 13	7.7	6.6	8.9	Aug. 13	7.7	6.7	8.7
June 14				July 14	8.0	7.2	9.2	Aug. 14	7.9	7.5	8.6
June 15				July 15	7.5	6.3	8.7	Aug. 15	6.9	6.6	7.5
June 16				July 16	7.6	6.3	8.7	Aug. 16	6.3	5.8	6.6
June 17				July 17	7.9	7.2	8.6	Aug. 17	6.7	6.1	7.5
June 18	6.0	4.2	7.8	July 18	8.0	6.6	9.3	Aug. 18	6.4	5.3	7.3
June 19	7.1	5.9	8.6	July 19	8.3	7	9.3	Aug. 19	6.6	5.8	7.5
June 20	7.6	5.9	9.5	July 20	8.9	8.1	10	Aug. 20	6.8	6.3	7.5
June 21	7.9	6.7	9.5	July 21	8.5	7.6	9.7	Aug. 21	6.6	6.1	7
June 22	7.5	6.3	8.4	July 22	8.6	7	10.3	Aug. 22	6.9	6.4	7.3
June 23	7.3	5.9	8.7	July 23	8.7	7.9	9.3	Aug. 23	6.9	6.4	7.5
June 24	6.6	5.9	7.3	July 24	7.9	7	8.4	Aug. 24	6.8	6.3	7.6
June 25	6.3	5.6	7.2	July 25	8.1	7.3	8.9	Aug. 25	6.8	5.9	7.5
June 26	6.2	4.2	8.1	July 26	8.1	7.3	9	Aug. 26	6.2	5.2	7.2
June 27	7.2	5.3	9.2	July 27	7.6	6.6	8.4	Aug. 27	6.3	5.3	7
June 28	8.1	6.3	10	July 28	6.9	5.6	7.8	Aug. 28	5.7	4.4	6.9
June 29	8.9	7.3	10.6	July 29	7.4	6.4	8.6	Aug. 29			
June 30	9.0	7.8	10.1	July 30	7.2	6.4	7.8	Aug. 30			
				July 31	7.4	6.3	8.6	Aug. 31			


WATER TEMPERATURES AT CONTROL C. 1995
Temperature (C.)
11
10
9
8
7
6
5
4
June 18
July 1
July 15
Aug 1
Aug 15
Aug 28
June 18 - August 28, 1995
Mean
Min.
Max.

WATER TEMPERATURES AT CULVERT CREEK 1995

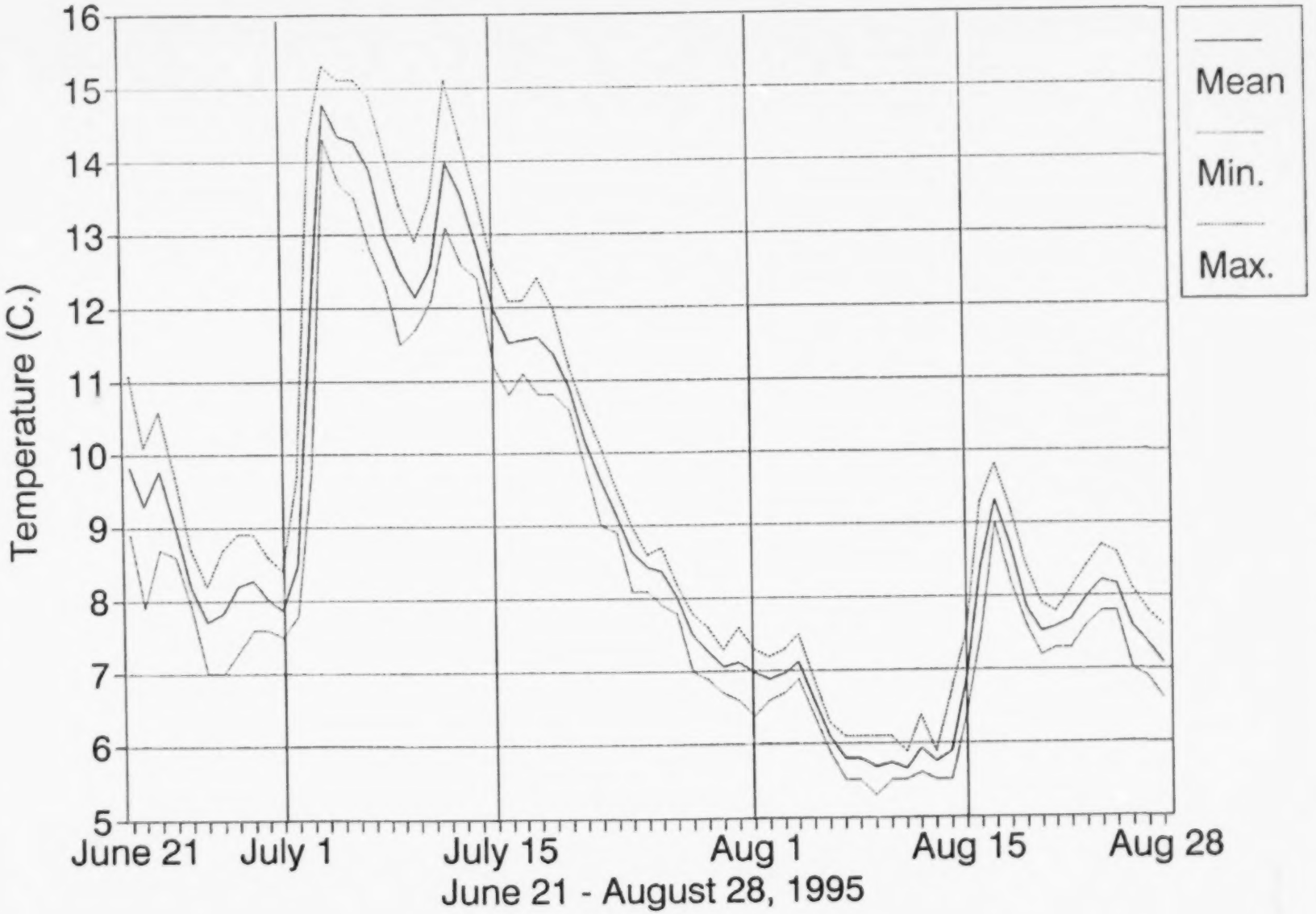
DATE	MEAN	MIN.	MAX.	DATE	MEAN	MIN.	MAX.	DATE	MEAN	MIN.	MAX.
June 1				July 1	9.6	8.7	10.4	Aug. 1	8.2	6.6	9.7
June 2				July 2	8.8	8.4	9.2	Aug. 2	8.0	6.7	8.9
June 3				July 3	8.2	7.9	8.6	Aug. 3	9.5	7.9	11.1
June 4				July 4	7.7	7.5	7.9	Aug. 4	10.7	9.0	12.4
June 5				July 5	7.4	6.9	8.1	Aug. 5	8.1	4.4	12.1
June 6				July 6	7.6	6.9	8.4	Aug. 6	7.9	6.1	9.8
June 7				July 7	7.8	6.3	9.3	Aug. 7	8.3	6.9	10.4
June 8				July 8	7.9	6.9	8.7	Aug. 8	9.4	6.7	12.9
June 9				July 9	8.4	6.7	10.3	Aug. 9	9.0	3.6	14.6
June 10				July 10	8.2	7.9	9.0	Aug. 10	10.0	5.3	15.1
June 11				July 11	7.8	7.3	8.2	Aug. 11	9.0	7.0	11.7
June 12				July 12	8.4	7.5	10.0	Aug. 12	9.0	7.5	11.2
June 13				July 13	8.3	7.2	9.3	Aug. 13	8.5	7.3	9.5
June 14				July 14	8.8	7.8	10.3	Aug. 14	8.8	8.4	9.5
June 15				July 15	8.3	6.9	9.7	Aug. 15	7.6	7.2	8.2
June 16				July 16	8.4	7.0	9.7	Aug. 16	6.7	6.3	7.2
June 17				July 17	8.8	7.9	9.7	Aug. 17	7.2	6.6	7.9
June 18	6.7	4.8	9.0	July 18	8.8	7.3	10.6	Aug. 18	6.9	5.8	8.1
June 19	7.8	6.6	9.0	July 19	9.3	7.9	10.6	Aug. 19	7.0	6.1	7.8
June 20	8.3	6.7	10.3	July 20	10.1	9.2	11.4	Aug. 20	7.5	6.9	8.4
June 21	8.6	7.5	10.1	July 21	9.4	8.6	10.3	Aug. 21	7.2	6.7	7.6
June 22	8.1	6.9	9.3	July 22	9.5	7.9	11.2	Aug. 22	7.4	7.0	7.9
June 23	7.9	6.6	9.7	July 23	9.8	9.0	10.4	Aug. 23	7.4	6.9	7.9
June 24	7.3	6.7	7.9	July 24	9.0	8.1	9.7	Aug. 24	7.5	6.7	8.4
June 25	7.0	6.4	7.8	July 25	8.9	8.2	9.7	Aug. 25	7.3	6.4	8.1
June 26	6.7	4.7	8.7	July 26	9.2	8.2	10.6	Aug. 26	6.8	5.5	7.9
June 27	8.0	5.9	10.6	July 27	8.5	7.5	9.7	Aug. 27	6.9	5.9	7.9
June 28	9.1	7.2	11.4	July 28	7.9	6.6	9.0	Aug. 28	6.3	4.8	7.5
June 29	10.0	8.2	12.3	July 29	8.3	7.0	10.0	Aug. 29			
June 30	10.1	8.9	11.1	July 30	8.0	6.9	8.7	Aug. 30			
				July 31	8.5	7.2	10.3	Aug. 31			


WATER TEMPERATURES AT CULVERT C. 1995
Temperature (C.)
16
14
12
10
8
6
4
2
Air Temperatures
Mean
Min.
Max.
June 18
July 1
July 15
Aug 1
Aug 15
Aug 28
June 18 - August 28, 1995

WATER TEMPERATURES AT FATFISH CREEK 1995

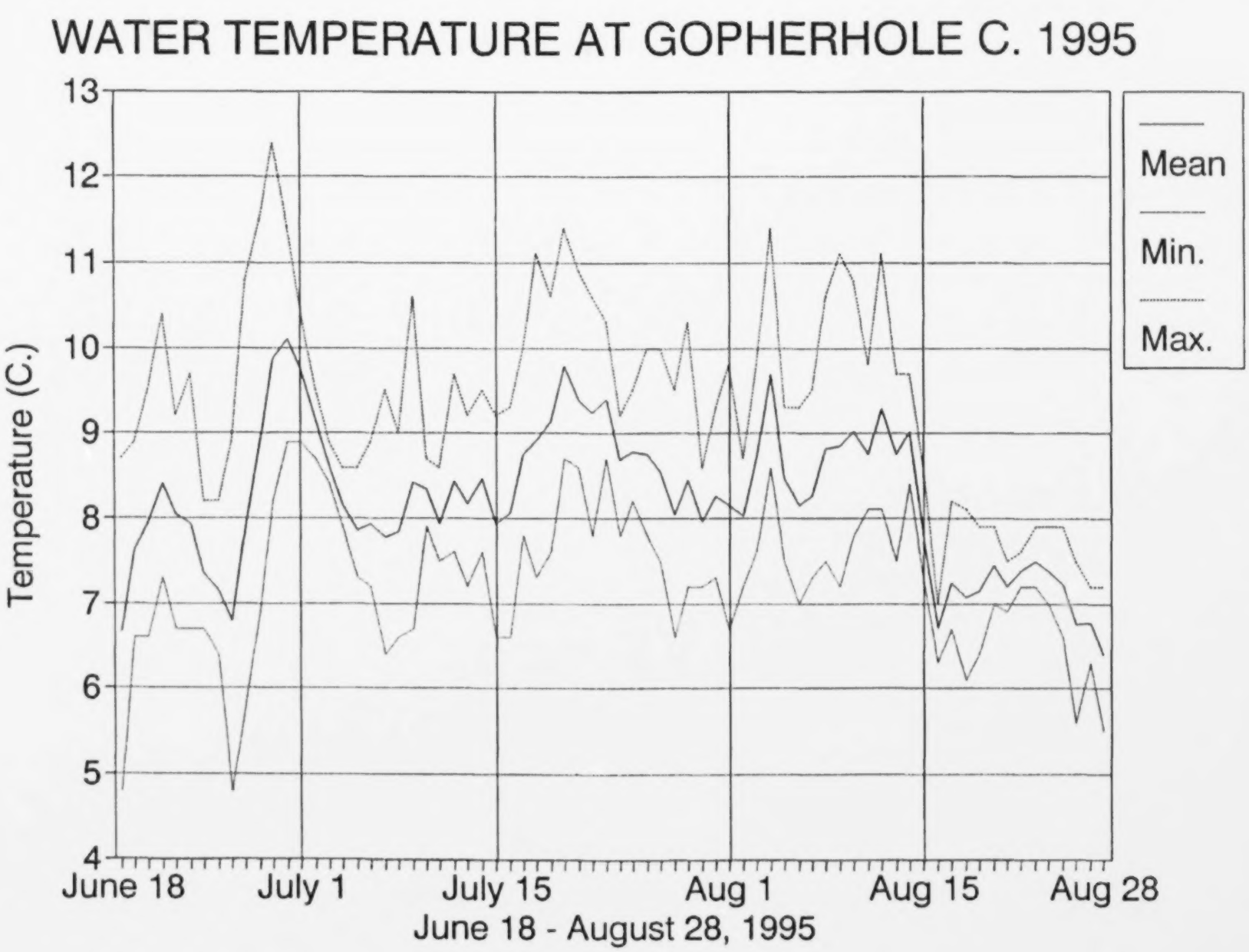
DATE	MEAN	MIN.	MAX.	DATE	MEAN	MIN.	MAX.	DATE	MEAN	MIN.	MAX.
June 1				July 1	7.9	7.5	8.4	Aug. 1	7.0	6.4	7.3
June 2				July 2	8.5	7.8	9.7	Aug. 2	6.9	6.6	7.2
June 3				July 3	11.9	9.8	14.3	Aug. 3	7.0	6.7	7.3
June 4				July 4	14.8	14.3	15.3	Aug. 4	7.1	6.9	7.5
June 5				July 5	14.3	13.7	15.1	Aug. 5	6.6	6.4	6.9
June 6				July 6	14.3	13.5	15.1	Aug. 6	6.1	5.9	6.3
June 7				July 7	13.9	12.8	14.9	Aug. 7	5.8	5.5	6.1
June 8				July 8	13.0	12.3	14.1	Aug. 8	5.8	5.5	6.1
June 9				July 9	12.5	11.5	13.4	Aug. 9	5.7	5.3	6.1
June 10				July 10	12.2	11.7	12.9	Aug. 10	5.7	5.5	6.1
June 11				July 11	12.6	12.1	13.5	Aug. 11	5.7	5.5	5.9
June 12				July 12	14.0	13.1	15.1	Aug. 12	5.9	5.6	6.4
June 13				July 13	13.5	12.6	14.3	Aug. 13	5.7	5.5	5.9
June 14				July 14	12.8	12.4	13.5	Aug. 14	5.9	5.5	6.7
June 15				July 15	12.0	11.2	12.6	Aug. 15	6.9	6.4	7.5
June 16				July 16	11.5	10.8	12.1	Aug. 16	8.4	7.5	9.3
June 17				July 17	11.6	11.1	12.1	Aug. 17	9.3	9	9.8
June 18				July 18	11.6	10.8	12.4	Aug. 18	8.7	8.2	9.2
June 19				July 19	11.4	10.8	12	Aug. 19	7.9	7.6	8.4
June 20				July 20	10.9	10.6	11.2	Aug. 20	7.5	7.2	7.9
June 21	9.8	8.9	11.1	July 21	10.2	9.8	10.6	Aug. 21	7.6	7.3	7.8
June 22	9.3	7.9	10.1	July 22	9.6	9	10.1	Aug. 22	7.7	7.3	8.1
June 23	9.8	8.7	10.6	July 23	9.1	8.9	9.5	Aug. 23	8.0	7.6	8.4
June 24	9.0	8.6	9.7	July 24	8.6	8.1	9	Aug. 24	8.2	7.8	8.7
June 25	8.2	7.9	8.7	July 25	8.4	8.1	8.6	Aug. 25	8.2	7.8	8.6
June 26	7.7	7	8.2	July 26	8.4	7.9	8.7	Aug. 26	7.6	7	8.1
June 27	7.8	7	8.7	July 27	8.0	7.8	8.2	Aug. 27	7.3	6.9	7.8
June 28	8.2	7.3	8.9	July 28	7.5	7	7.8	Aug. 28	7.1	6.6	7.6
June 29	8.3	7.6	8.9	July 29	7.3	6.9	7.6	Aug. 29			
June 30	8.0	7.6	8.6	July 30	7.1	6.7	7.3	Aug. 30			
				July 31	7.1	6.6	7.6	Aug. 31			

WATER TEMPERATURES AT FATFISH C. 1995



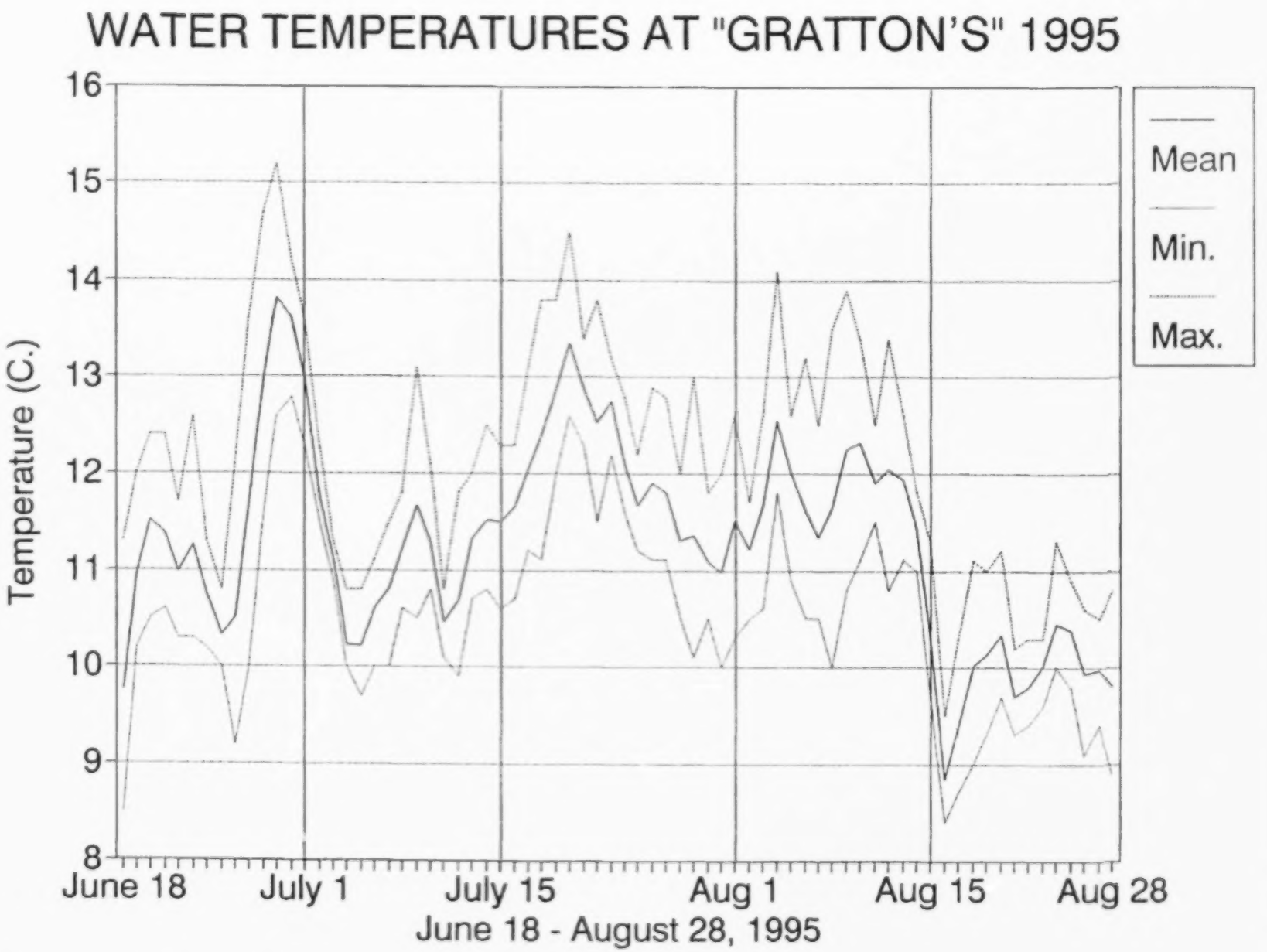
WATER TEMPERATURES AT GOPHERHOLE CREEK 1995

DATE	MEAN	MIN.	MAX.	DATE	MEAN	MIN.	MAX.	DATE	MEAN	MIN.	MAX.
June 1				July I	9.7	8.9	10.4	Aug. 1	8.2	6.7	9.8
June 2				July 2	9.1	8.7	9.5	Aug. 2	8.0	7.2	8.7
June 3				July 3	8.6	8.4	8.9	Aug. 3	8.7	7.6	9.8
June 4				July 4	8.2	7.9	8.6	Aug. 4	9.7	8.6	11.4
June 5				July 5	7.8	7.3	8.6	Aug. 5	8.5	7.5	9.3
June 6				July 6	7.9	7.2	8.9	Aug. 6	8.2	7.0	9.3
June 7				July 7	7.8	6.4	9.5	Aug. 7	8.3	7.3	9.5
June 8				July 8	7.8	6.6	9.0	Aug. 8	8.8	7.5	10.6
June 9				July 9	8.4	6.7	10.6	Aug. 9	8.8	7.2	11.1
June 10				July 10	8.3	7.9	8.7	Aug. 10	9.0	7.8	10.8
June 11				July 11	7.9	7.5	8.6	Aug. 11	8.8	8.1	9.8
June 12				July 12	8.4	7.6	9.7	Aug. 12	9.3	8.1	11.1
June 13				July 13	8.2	7.2	9.2	Aug. 13	8.8	7.5	9.7
June 14				July 14	8.5	7.6	9.5	Aug. 14	9.0	8.4	9.7
June 15				July 15	7.9	6.6	9.2	Aug. 15	7.8	7.3	8.6
June 16				July 16	8.1	6.6	9.3	Aug. 16	6.7	6.3	7.0
June 17				July 17	8.8	7.8	10.0	Aug. 17	7.2	6.7	8.2
June 18	6.7	4.8	8.7	July 18	8.9	7.3	11.1	Aug. 18	7.1	6.1	8.1
June 19	7.6	6.6	8.9	July 19	9.2	7.6	10.6	Aug. 19	7.1	6.4	7.9
June 20	8.0	6.6	9.5	July 20	9.8	8.7	11.4	Aug. 20	7.5	7.0	7.9
June 21	8.4	7.3	10.4	July 21	9.4	8.6	10.9	Aug. 21	7.2	6.9	7.5
June 22	8.0	6.7	9.2	July 22	9.2	7.8	10.6	Aug. 22	7.4	7.2	7.6
June 23	7.9	6.7	9.7	July 23	9.4	8.7	10.3	Aug. 23	7.5	7.2	7.9
June 24	7.4	6.7	8 2	July 24	8.7	7.8	9.2	Aug. 24	7.4	7.0	7.9
June 25	7.2	6.4	8.2	July 25	8.8	8.2	9.5	Aug. 25	7.2	6.6	7.9
June 26	6.8	4.8	8.9	July 26	8.8	7.8	10.0	Aug. 26	6.8	5.6	7.5
June 27	7.9	5.8	10.8	July 27	8.6	7.5	10.0	Aug. 27	6.8	6.3	7.2
June 28	8.9	6.9	11.5	July 28	8.1	6.6	9.5	Aug. 28	6.4	5.5	7.2
June 29	9.9	8.2	12.4	July 29	8.5	7.2	10.3	Aug. 29			
June 30	10.1	8.9	11.4	July 30	8.0	7.2	8.6	Aug. 30			
				July 31	8.3	7.3	9.3	Aug. 31			


WATER TEMPERATURE AT GOPHERHOLE C. 1995
Temperature (C.)
13
12
11
10
9
8
7
6
5
4
June 18
July 1
July 15
Aug 1
Aug 15
Aug 28
June 18 - August 28, 1995
Mean
Min.
Max.

WATER TEMPERATURES OF MESILINKA RIVER AT "GRATTON'S" LOCATION

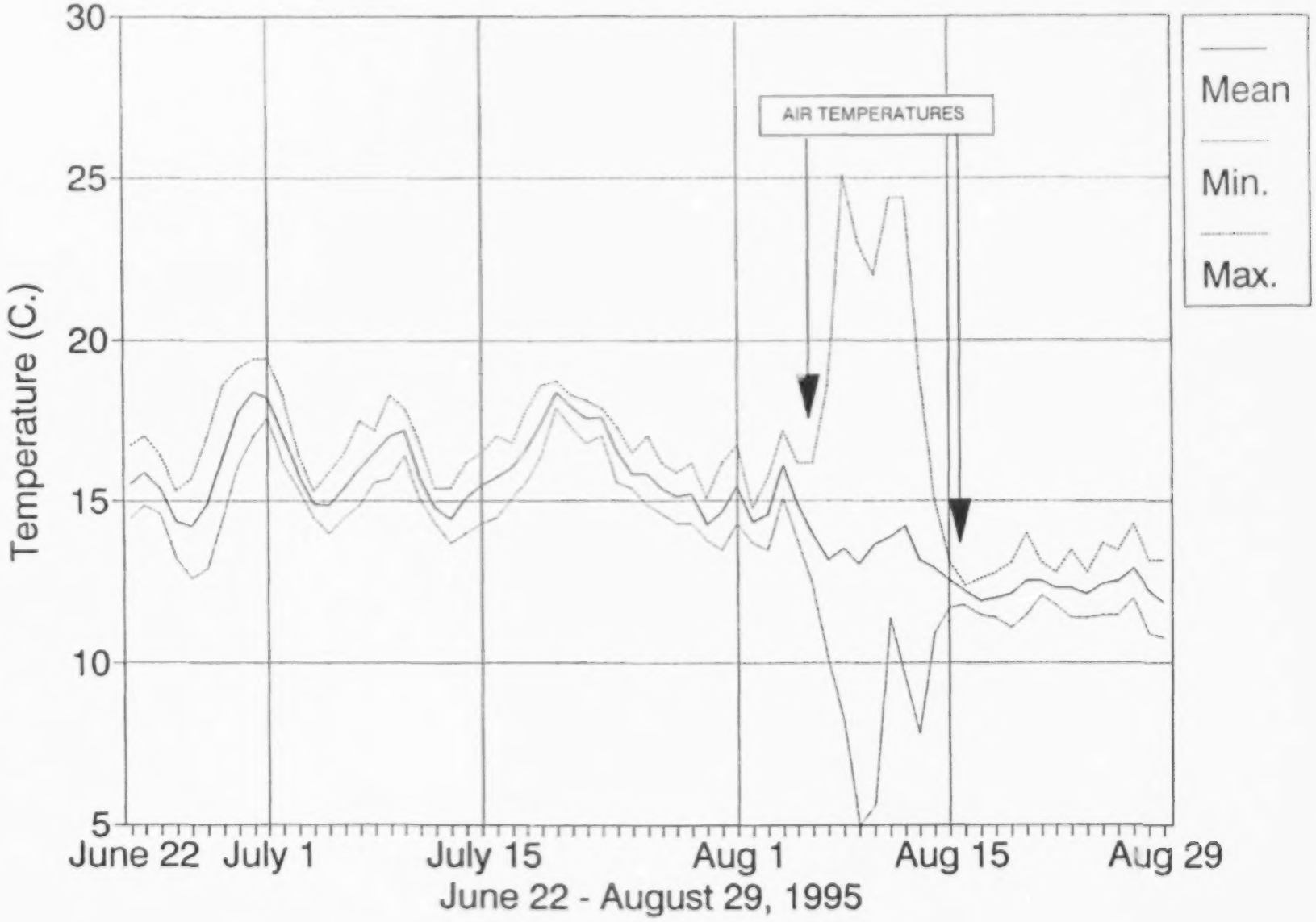
DATE	MEAN	MIN.	MAX.	DATE	MEAN	MIN.	MAX.	DATE	MEAN	MIN.	MAX.
June 1				July 1	13.0	12.3	13.6	Aug. 1	11.5	10.3	12.6
June 2				July 2	11.8	11.5	12.3	Aug. 2	11.2	10.5	11.7
June 3				July 3	11.1	10.9	11.3	Aug. 3	11.7	10.6	12.6
June 4				July 4	10.2	10.0	10.8	Aug. 4	12.5	11.8	14.1
June 5				July 5	10.2	9.7	10.8	Aug. 5	12.0	10.9	12.6
June 6				July 6	10.6	10.0	11.1	Aug. 6	11.6	10.5	13.2
June 7				July 7	10.8	10.0	11.5	Aug. 7	11.3	10.5	12.5
June 8				July 8	11.2	10.6	11.8	Aug. 8	11.7	10.0	13.5
June 9				July 9	11.7	10.5	13.1	Aug. 9	12.3	10.8	13.9
June 10				July 10	11.3	10.8	12.1	Aug. 10	12.3	11.1	13.4
June 11				July 11	10.5	10.1	10.8	Aug. 11	11.9	11.5	12.5
June 12				July 12	10.7	9.9	11.8	Aug. 12	12.0	10.8	13.4
June 13				July 13	11.3	10.7	12.0	Aug. 13	11.9	11.1	12.6
June 14				July 14	11.5	10.8	12.5	Aug. 14	11.4	11.0	11.8
June 15				July 15	11.5	10.6	12.3	Aug. 15	10.3	9.7	11.3
June 16				July 16	11.7	10.7	12.3	Aug. 16	8.8	8.4	9.5
June 17				July 17	12.0	11.2	13.1	Aug. 17	9.4	8.7	10.3
June 18	9.7	8.5	11.3	July 18	12.4	11.1	13.8	Aug. 18	10.0	9.0	11.1
June 19	10.9	10.2	12.0	July 19	12.9	12.0	13.8	Aug. 19	10.1	9.3	11.0
June 20	11.5	10.5	12.4	July 20	13.4	12.6	14.5	Aug. 20	10.3	9.7	11.2
June 21	11.4	10.6	12.4	July 21	12.9	12.3	13.4	Aug. 21	9.7	9.3	10.2
June 22	11.0	10.3	11.7	July 22	12.5	11.5	13.8	Aug. 22	9.8	9.4	10.3
June 23	11.3	10.3	12.6	July 23	12.8	12.2	13.2	Aug. 23	10.0	9.6	10.3
June 24	10.8	10.2	11.3	July 24	12.1	11.6	12.8	Aug. 24	10.5	10.0	11.3
June 25	10.3	10.0	10.8	July 25	11.7	11.2	12.2	Aug. 25	10.4	9.8	10.9
June 26	10.5	9.2	12.1	July 26	11.9	11.1	12.9	Aug. 26	9.9	9.1	10.6
June 27	11.7	10.0	13.6	July 27	11.8	11.1	12.8	Aug. 27	10.0	9.4	10.5
June 28	13.0	11.6	14.7	July 28	11.3	10.5	12.0	Aug. 28	9.8	8.9	10.8
June 29	13.8	12.6	15.2	July 29	11.4	10.1	13.0	Aug. 29			
June 30	13.6	12.8	14.2	July 30	11.1	10.5	11.8	Aug. 30			
				July 31	11.0	10.0	12.0	Aug. 31			


WATER TEMPERATURES AT "GRATTON'S" 1995
Temperature (C.)
16
15
14
13
12
11
10
9
8
June 18
July 1
July 15
Aug 1
Aug 15
Aug 28
June 18 - August 28, 1995
Mean
Min.
Max.

WATER TEMPERATURES AT NATION RIVER 1995

DATE	MEAN	MIN.	MAX.	DATE	MEAN	MIN.	MAX.	DATE	MEAN	MIN.	MAX.
June 1				July 1	18.2	17.6	19.4	Aug. 1	15.4	14.3	16.7
June 2				July 2	17.1	16.2	18.3	Aug. 2	14.3	13.7	14.8
June 3				July 3	15.9	15.4	16.4	Aug. 3	14.6	13.5	15.7
June 4				July 4	14.9	14.5	15.3	. Aug. 4	16.1	15.1	17.2
June 5				July 5	14.9	14.0	15.9	Aug. 5	14.9	13.8	16.2
June 6				July 6	15.4	14.5	16.5	Aug. 6	14.0	12.4	16.2
June 7				July 7	16.0	14.9	17.5	Aug. 7	13.2	10.1	18.6
June 8				July 8	16.5	15.6	17.2	Aug. 8	13.6	8.2	25.1
June 9				July 9	17.0	15.7	18.3	Aug. 9	13.1	5.0	23.0
June 10				July 10	17.2	16.4	17.9	Aug. 10	13.6	5.6	22.0
June 11				July 11	15.8	15.1	16.8	Aug. 11	13.9	11.4	24.4
June 12				July 12	14.8	14.3	15.4	Aug. 12	14.2	9.5	24.4
June 13				July 13	14.5	13.7	15.4	Aug. 13	13.2	7.8	19.1
June 14				July 14	15.1	14.0	16.2	Aug. 14	12.9	10.9	15.1
June 15				July 15	15.5	14.3	16.5	Aug. 15	12.5	11.7	13.1
June 16				July 16	15.7	14.5	17.0	Aug. 16	12.2	11.8	12.4
June 17				July 17	16.0	15.1	16.8	Aug. 17	11.9	11.5	12.6
June 18				July 18	16.6	15.6	17.8	Aug. 18	12.0	11.4	12.8
June 19				July 19	17.4	16.4	18.6	Aug. 19	12.1	11.1	13.1
June 20				July 20	18.4	17.9	18.7	Aug. 20	12.5	11.5	14.0
June 21				July 21	17.9	17.3	18.3	Aug. 21	12.5	12.1	13.1
June 22	15.5	14.5	16.7	July 22	17.5	16.8	18.1	Aug. 22	12.3	11.8	12.8
June 23	15.9	14.9	17.0	July 23	17.6	17.0	17.9	Aug. 23	12.3	11.4	13.5
June 24	15.4	14.6	16.4	July 24	16.5	15.6	17.3	Aug. 24	12.1	11.4	12.8
June 25	14.4	13.2	15.3	July 25	15.9	15.4	16.5	Aug. 25	12.4	11.5	13.7
June 26	14.2	12.6	15.7	July 26	15.9	14.9	17.0	Aug. 26	12.5	11.5	13.5
June 27	14.9	12.9	17.0	July 27	15.4	14.6	16.2	Aug. 27	12.9	12.0	14.3
June 28	16.4	14.5	18.6	July 28	15.1	14.3	15.9	Aug. 28	12.2	10.9	13.2
June 29	17.8	16.1	19.1	July 29	15.2	14.3	16.2	Aug. 29	11.9	10.8	13.2
June 30	18.4	17.0	19.4	July 30	14.3	13.8	15.1	Aug. 30			
				July 31	14.7	13.5	16.2	Aug. 31			

WATER TEMPERATURES AT NATION RIVER 1995



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